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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/662,809

09/16/2003

Seiji Nagai

T36-159069M/KOH

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12/15/2006

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EXAMINER

RAO, G NAGESH

ART UNIT

PAPER NUMBER

1722

DATE MAILED: 12/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/662,809	Applicant(s) NAGAI ET AL.	
	Examiner G. Nagesh Rao	Art Unit 1722	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3,4,6-15,17 and 18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3,4,6-15,17 and 18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☒ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Priority

1) Should applicant desire to obtain the benefit of foreign priority under 35 U.S.C. 119(a)-(d) prior to declaration of an interference, a certified English translation of the foreign application must be submitted in reply to this action. 37 CFR 41.154(b) and 41.202(e).

Failure to provide a certified translation may result in no benefit being accorded for the non-English application.

Continued Examination Under 37 CFR 1.114

2) A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/20/06 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
- 3) Claims 1, 3-4, 6-15, and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tischler (US Pg Pub 2002/0028314).

Examiner has reviewed applicant's arguments and after consideration is withdrawing the 112 rejections and objections since the claims have either been amended or clarified in the arguments to fully comply with examiner's requests.

Tischler 314 pertains to a process for producing Gallium-Nitride (GaN) semiconductor substrates via a variety of various methods in examples disclosed in the specification furthermore note that Tischler 314 refers to the GaN layer as a

metal nitride (M*N) however that is understood by the examiner to be a synonym for a Group III-V nitride material (See Sections 0002-0013). Tischler 314 in specific embodiments teaches a sacrificial silicon substrate having been etched away via HCl while the substrate/M*N structure is preferably maintained. Tischler 314 also teaches that introduction of HCl is passed over the Gallium to transport it into the reactor in the form of "Gallium Chloride" which applicant attributed in the remarks as being the Halide Agent to utilize in the reactor (See Sections 0014-0019 and 0050-0051).

The M*N layer for example GaN may be deposited directly on the surface of the crystalline or non-crystalline substrate, or alternatively it may be deposited on an upper most surface of one or more intermediate layers which in turn are deposited on the crystalline substrate. The one or more intermediate layers may serve as a buffer layer to enhance the crystallinity of the M*N layer, as a template for the subsequent M*N growth thereon, or the intermediate layer(s) may serve as protective layer(s) or as an etch stop to prevent the etchant for the sacrificial substrate from etching into the M*N material (See Section 0020-0021) but thereby denoting that the etch could occur from the rear portion of the sacrificial substrate since the intermediate buffer layers are followed by the substrate before the top layer of M*N is completely processed. As well the M*N layer could contain more

aluminum in the Group III nitride compound in the event the layer is decidedly an AlN layer or a AlGa_N or AlGaInN layer (See Sections 0092-0093).

The growth of the M*N layer material may be carried out in a HVPE reactor whereby although denoted as a hydride vapor phase epitaxy reactor, examiner qualifies this as an equivalent and capable of handling applicant's claim of a halide vapor phase epitaxy. Upon reviewing applicant's specification, examiner noted the reference of HVPE as being a halide based reactor due to the use of HCl and GaCl (applicant's specification and remarks) as either the gaseous etchant (HCl) or source material for growing the nitride semiconductor film (GaCl). Although Tischler 314 denotes HVPE differently, it does disclose the use of HCl and GaCl as either the gaseous etchant or source material (GaCl see Section 0051) for creating the free standing M*N semiconductor substrate.

Furthermore Tischler 314 teaches processing parameters for the HVPE method have temperatures growth for a GaN layer be between 1000-1200⁰C and the desired thickness range be between 1-1000 microns but preferably at 100-300 microns thus reading on claimed thickness and temperature variations as claimed by applicant (See Section 0050 and 0025) as well the ability to grow more than one layer of M*N materials as suggested by the language of section 0051. However as noted in that preferred embodiment the process begins with a "...growth

temperature (in the range of 800-1300⁰C) and introducing the growth precursors for GaN formation...”, therefore covering said 800-900⁰C range claimed by applicant.

Finally Tischler 314 teaches an ability to prevent lattice mismatch dislocation in particular preventing dislocations i.e. warping of the M*N substrate material which is in turn a form of a Group III nitride compound (See Section 0040). This and the fact that the methodology of creating said substrate will have the rear surface of said silicon substrate opposing the surface on which said group III nitride compound semiconductor layer is formed. Also Examiner invites applicant's to review Sections 0064-0094) for further details and information on various and alternative embodiments disclosed in the reference that teach processing parameters related to the growth and production of this Group III nitride semiconductor compound.

Examiner has denoted from applicant's remarks and currently claimed invention that Tischler 314 does not outright explicitly teach the first layer of the metal-nitride semiconductor being processed at a temperature of 800-900⁰C and the second layer of metal-nitride material (i.e. Group III in particular) manufactured at a temperature of not lower than 1000⁰C.

However Tischler 314 does teach that the compound semiconductor is manufactured in the range of 800-1300⁰C denoting that it would be conceivable to one having ordinary skill in the art at the time of the invention via routine experimentation to produce the structure at a variety of temperature levels and ranges depending on the state of the layer manufacture for the compound semiconductor device. There is nothing precluding in this reference or applicant's remarks that would suggest one having ordinary skill in the art at the time of the invention would not understand or conceive of the process as claimed by applicant. The teachings are there and obvious to modify to meet the parameters claimed by the applicant.

Response to Arguments

4) Applicant's arguments filed 10/10/06 have been fully considered but they are not persuasive. Examiner notes the following.

Examiner has noted the amended changes but upon further review of the reference Tischler 314 still teaches or obviates the prescribed elements, ranges, and process claimed by applicant. The narrowed temperature range as processing parameters claimed by applicant still falls within scope of what is taught by Tischler 314 as noted in the rejection above. Applicant is invited to contact

examiner to discuss ideas that might help put the case in condition for allowance and overcoming the new 103 rejection utilizing Tischler 134.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to G. Nagesh Rao whose telephone number is (571) 272-2946. The examiner can normally be reached on 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra Gupta can be reached on (571)272-1316. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

GNR


ROBERT DAVIS
PRIMARY EXAMINER
GROUP 1300-1700

12/11/06